

What is claimed is:

1. A sparger system for use in a recycle-based fluidized bed hydrocarbon partial oxidation reactor which comprises:

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(a) a first sparger for feeding a mixture of oxygen and air to said reactor; and

(b) a second sparger for feeding a mixture of oxygen, recycled hydrocarbon, and fresh feed hydrocarbon to said reactor.

10 2. The sparger system of claim 1, wherein said mixture of oxygen and air is present in a volume ratio of between about 0.25 : 1.0 to 1.25 : 1.0.

15 3. The sparger system of claim 2, wherein said mixture is present in a volume ratio of between about 0.4 : 1.0 to 0.65 : 1.0.

20 4. The sparger system of claim 1, wherein said first sparger is located in the bottom portion of said reactor.

5. The sparger system of claim 1, wherein said first sparger is constructed from a material selected from the group consisting of: carbon steel and low-alloy steels.

6. The sparger system of claim 1, wherein said mixture fed by said first sparger is fed to said reactor at a flow rate between about 25% to 50% of the total reactor superficial velocity.

5 7. The sparger system of claim 6, wherein said mixture is fed to said reactor at a flow rate between about 30% to 40% of the total reactor superficial velocity.

10 8. The sparger system of claim 1, wherein said mixture of oxygen, recycled hydrocarbon, and fresh feed hydrocarbon is present in a volume ratio of between about 1.0 : 45.0 : 5.0 to 1.0 : 2.5 : 0.5.

15 9. The sparger system of claim 8, wherein said mixture is present in a volume ratio between about 1.0 : 8.5 : 1.0 to 1.0 : 4.0 : 0.5.

10. The sparger system of claim 1, wherein said second sparger is disposed above said first sparger.

20 11. The sparger system of claim 10, wherein said second sparger is disposed about 0.1 feet to 10 feet above said first sparger.

12. The sparger system of claim 1, wherein said mixture fed by said second sparger is fed to said reactor at a flow rate between about 50% to 75% of the total reactor superficial velocity.

13. The sparger system of claim 12, wherein said mixture fed by said second sparger is fed to said reactor at a flow rate between about 55% to 70% of the total reactor superficial velocity.

5 14. The sparger system of claim 1, wherein said reactor has a superficial velocity between about 1.5 to 2.5 ft/s.

10 15. A method for feeding reactant streams to a recycle-based reactor comprising the steps of:

- (a) providing a first sparger disposed in the bottom portion of said reactor;
- (b) feeding a mixture of oxygen and air to said first sparger;
- (c) providing a second sparger above said first sparger; and
- (d) feeding a mixture of oxygen, recycled hydrocarbon, and fresh feed hydrocarbon to said second sparger.

15 16. A continuous method for the partial oxidation of a hydrocarbon feed comprising the steps of:

- (a) feeding a mixture of oxygen and air to a first sparger disposed in the bottom portion of a reactor;
- (b) feeding a mixture of oxygen and fresh feed hydrocarbon to a second sparger disposed within said reactor above said first sparger; and
- (c) recycling unreacted hydrocarbon from said reactor, whereby said unreacted hydrocarbon is fed back to said reactor via said second sparger.